Magnetic Resonance of Biomolecules

by P. F. Knowles, D. Marsh and H. W. E. Rattle
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This book aims to provide an introduction to the use of nuclear magnetic resonance (NMR) and electron spin resonance (ESR) spectroscopy in biology. Both techniques have been widely applied to biological problems in recent years and a number of specialist texts exist, but this is the first book to provide a unified general introduction to the use of both methods.

The physical basis of the magnetic resonance experiment is outlined in a qualitative way in the first chapter. The remainder of the book is in two sections, treating NMR and ESR separately, but with a parallel chapter arrangement in each section. Thus for each technique there is first a discussion of the relation between the spectroscopic parameters and molecular structure and dynamics. This is followed by description of the apparatus and methods required to obtain a spectrum, a survey of biological applications and finally a chapter on more advanced instrumental methods.

In both the NMR and ESR sections, approximately equal space is devoted to detailed descriptions of instrumental methods and to discussions of the biological applications of the techniques. This is perhaps not an ideal balance for an introductory book, since the student will most probably want to know what kinds of questions the technique can answer before concerning himself too much with the details of spectrometer operation. Nonetheless, the ESR section, particularly, is a very readable introduction to the field, describing studies of metalloproteins, spin-labels and natural free-radicals briefly but clearly. The discussion of the biological applications of NMR is less satisfactory. Although a good range of examples is presented (with the exception of small molecule–protein interactions), many of them are rather out-of-date and the discussion is often too brief. For example, a description of the assignment of the ^{13}C resonances of oxytocin is followed by a picture of its proposed conformation, without any discussion of the arguments by which the existence of this conformation was deduced from the ^{1}H and ^{13}C NMR spectra.

In the theoretical section relaxation phenomena and chemical exchange effects – topics which are of considerable importance in the biological applications of NMR – receive rather cursory treatment. There are few errors of fact, but a rather annoying number of typographical errors.

A study of this book will clearly not allow the biochemist to go away and do his own NMR or ESR experiments. However, it will give him a feeling for the kind of information which can be obtained and should allow him to understand, in general terms, many of the NMR and ESR papers in the biochemical literature. As a very readable first introduction to the field it is to be recommended.

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